

AN ESSAY
ON
THE EFFECTS
OF
LEAD:
COMPRISING A FEW EXPERIMENTS
ON THE
SACCHARUM SATURNI,
AND ITS
APPLICATION IN THE CURE OF DISEASES.

BY THOMAS SEMMES,
OF MARYLAND;
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“Poisons in small doses are the best medicines, and the best
medicines in too large doses are poisonous.”

Withering's Botanical Arrangement.

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AN
INAUGURAL ESSAY,
FOR THE DEGREE OF
DOCTOR OF MEDICINE.

SUBMITTED TO THE EXAMINATION
OF THE
REV. JOHN EWING, S.S. T. P. PROVOST;
THE
TRUSTEES AND MEDICAL FACULTY
OF THE
UNIVERSITY OF PENNSYLVANIA,
ON THE
EIGHTH DAY OF JUNE, 1801.

TO
DOCTOR ELISHA CULLEN DICK.

TO you, in whom is concentrated, talents, professional eminence, and domestic virtues; under whose patronage and direction, my medical education was commenced and finished, with pleasure and improvement to myself; I beg leave to inscribe the following pages.

Although the connection of preceptor and pupil will now cease between us, permit me, dear sir, to hope for the continuance of those prudent counsels, and valuable instructions, with which, you have been pleased to favor me.

For the many polite and flattering attentions I have received from you, and your amiable family, accept the grateful acknowledgements of

Your Sincere Friend,

And Affectionate Pupil,

THOMAS SEMMES.

TO

BENJAMIN SMITH BARTON, M. D.

*Professor of Materia Medica, Natural History,
and Botany,*

IN THE UNIVERSITY OF PENNSYLVANIA;

SIR,

IT is with great pleasure, I avail myself of the present opportunity, to express my gratitude for the many particular marks of politeness and friendship, with which you have honored me, during my residence in Philadelphia.

That your happiness, and success in practice, may be commensurate with your talents and eminence in public life, is the wish of

Your Sincere Friend,

And Obedient Servant,

THE AUTHOR.

INTRODUCTION.

WHEN we contemplate the mischiefs, which have arisen from the application of different preparations of lead to the human body, the objections of those medical writers, who have viewed them in a light, so unfavourable; and have so strenuously opposed their internal exhibition, would appear to be just.

That lead has produced many disagreeable consequences will be readily granted. But to suppose that the preparations of this metal are invariably followed by deleterious effects, when admitted into the body, (if exhibited within bounds) would, in my opinion, be equally absurd, and erroneous. If we take a view of the materia medica, we shall behold enveloped in poison, many of our most active and useful medicines. The datura stramonium, the conium maculatum, and innumerable me-

tallic substances, in the hands of the ignorant, or when exhibited in improper quantities, disorganize the vital functions, and extinguish life. But, if these substances be managed judiciously, and administered with discretion, they relieve disease, prolong life, and prove highly advantageous to mankind.

The effects of substances, usually called poisons, are relative ; and the slightest observation will convince us, they act either as medicines, or as poisons, according to their quantity and quality. Animals have a greater or less aptitude to be acted on, by one substance, than by another ; or possess a peculiar idiosyncrasy of habit, whereby the most baneful effects will be produced by a certain substance, upon one, while upon another, the same substance would be attended with little or no effect. Hemlock is innoxious to cows ; hogs fatten on henbane ; and goats may consume large quantities of euphorbium, without injury ; but each of these vegetables are poisonous to many other animals. The stramonium constitutes an article of food to some animals, while the admission of a few grains into the stomach of a man, proves deleterious. Opium is a valuable medicine, yet it is known, that two persons, taking equal quantities, may be

differently affected. Persons, who labour in quicksilver mines, seldom remain free from palsy, or some other complaint, longer than two, three, or four years; the effects of this mineral, are not less striking, than those which sometimes arise from the effluvia of lead: Gilders and others, who suffer from mercury, are much afflicted with tremors and debility, particularly in their hands; and, when the disease is once confirmed, they have no command over the muscles, which naturally obey the will.* It also, under certain states of the system, disposes wounds of the mildest nature to ulceration, and not unfrequently occasions the true phagedena, a distressing and often fatal ulcer; a child, whose system was under the influence of this mineral, was blooded, the orifice, instead of healing, became inflamed; the wound in three days had considerably enlarged, destroying the integuments and leaving bare the blood-vessels; on the fourth day, death ensued.†

The oxygenated muriate of mercury, in the proportion of an eighth or sixth of a grain, and arsenic in small doses, are innocent and salutary remedies, in certain diseases; but,

* Vid. Clutterbuck on the poison of lead and copper.

† Notes from Professor Barton's M. S. Lectures.

when taken in too large quantities, are followed by the most fatal consequences.

The different systems of the same body are not alike influenced by the same poison. The carbonic acid gas, when inhaled, immediately destroys life, but, when taken into the stomach, is not unpleasant to the taste, and, in some cases, is useful as a medicine. The venom of the viper, according to the experiments of Fontana, may, without danger be taken into the stomach, and is said to possess tonic powers, but, if it be introduced into the sanguiferous system, it proves rapidly destructive.

Examples, illustrating the relative operation of poisons, might be advanced without number; suffice it to say, that the preparations of copper, arsenic, zinc, and other metals, though the most deleterious articles, belonging to the catalogue of medicines, are, when properly managed, important acquisitions to the *materia medica*.

I have shewn above, that the most valuable medicines may, occasionally, prove deleterious, yet no one contends on this account, that these articles should be excluded from the *materia medica*; lead, like all other powerful medicines when given in too large quantities, becomes a poison; but, we have the authority of many

respectable physicians, for asserting that its cautious internal exhibition, may be practised with perfect safety, and frequently with the greatest advantage to the patient.

It was my intention, when I chose lead, as a subject of a dissertation, to have instituted an extensive series of experiments, in order to ascertain, as nearly as possible, its operation on the human body. But I regret that, from the difficulty of obtaining a sufficient number of subjects, upon which to operate; together with the limited time, allowed to prepare a thesis; my design has been in a great measure frustrated.

OF THE MORBID EFFECTS OF LEAD.

Nicander, a physician and poet, who lived soon after the time of Hippocrates, seems to have been the first, who noticed the poisonous nature of lead; he mentions cerusse and litharge as the only metallic poisons, known at that time; since that period, much has been written on the subject. The effects of lead on the constitution are too obvious to escape our notice; the pallid countenances and frequent indisposition of persons, daily occupied in lead mines, are sufficient indications of its unwholesome qualities. I shall, however, notice a few instances, in which its deleterious effects were very plainly marked. The cholic, which was so long epidemic in Devonshire, was owing to the poison of the leaden utensils, employed by the inhabitants of that part of the country in making cider, which constitutes their principal drink.*

The celebrated German traveller, Professor Thunberg, on his passage to the Cape of Good Hope, supped, together with many

* Vid. Med. Trans. Vol. I.

others on board the vessel, on some pancakes, in which, through mistake, there was a considerable quantity of white lead. The consequences of this accident were very distressing, although no life was lost; its first effects were sickness at stomach and puking; and most of those, in whom this took place immediately, remained entirely exempt from further inconvenience. The captain, however, who vomited in the commencement, was attacked two days after, with a most violent cholic; he was of a consumptive habit, but while the morbid effects of the poison prevailed, he was free from cough and other symptoms of the pulmonary affection. No one, who suffered from this unfortunate mistake, sustained greater injury than Dr. Thunberg; he was affected with nausea, violent reachings, cholic, a complete salivation and ulceration of the mouth, accompanied with a disagreeable stench; inflammation of the eyes and face, great pains in the ears, difficulty of breathing, violent throbbing of the temples, with pain in the head to such a degree, as to warrant the apprehension of apoplexy. The chaplain and cook's mate, were affected nearly in the same manner, except that they had, at times, a perfect iliac passion.

The injurious effects of this mineral are not exclusively confined to the human species; quadrupeds, birds, and even vegetables sometimes suffer by its noxious influence. Dr. Percival mentions a dog, who from laying frequently on a plate of lead, before a fire was seized with a paralytic affection of his limbs. Cats, he likewise observes, are sometimes driven to madness by it; and we have instances, on his authority, of birds being killed by eating pieces of red wafer, into the composition of which, enters a small quantity of lead. The effluvia, that arises from smelting mills, where lead is obtained from the ore, by settling on the adjacent fields, effectually destroys the herbage.

OF THE PREMONITORY SYMPTOMS FROM THE POISON OF LEAD, AND PROPHYLAXIS.

As the prevention of disease ought to be a primary consideration with physicians, a knowledge of the symptoms, which indicate its approach, are certainly of the greatest importance; from ignorance and inattention to these circumstances, many diseases have proved fatal, which might easily have been remedied, had they been attended to in their commencement. Some of the most formida-

ble, as pulmonary confumption, mania, epilepsy, apoplexy, &c. (part of them till lately fupposed to be incurable,) are now known to be frequently cured, when attended to in their recent or forming ftate; but when neglected till they are perfectly formed, or have attained their greateft degree of violence; how often, is even the phyfician, of fkill and information, vanquifhed in his efforts to give relief? and how feeble is theory in aiding his attempts? In few difeafes is the danger from delay, greater, than in thofe induced by the poifon of lead, and the prevention of none, can be accomplifhed, with greater eafe; its deleterious effects, difcover themfelves by a flow and almoft imperceptable progrefion; fmelters, miners, painters and potters are feldom affected before they are expofed to its effluvia for fome months; and frequently not till two, three or even four years have elapfed. The firft remarkable change which is produced in perfons, who are expofed to the pernicious influence of this metal, is an unfual yellownefs of the complexion, with a dark ftreak below the eyes. The ftomach next begins to be difordered, accompanied with preturnatural conftipation of the bowels, flight pains about the precordia, cramps in the

legs at night, and a sense of weight about the epigastric region. An enlargement of the glands about the throat, and swelling of the gums, with an increased secretion of the saliva, sometimes occur; and these symptoms when not attended to, frequently terminate in colic and paralysis, consumption, rheumatism and asthma. As soon therefore, as we are apprized of their approach, it becomes necessary to counteract them by every possible means. With this intention, persons, who are discovered to be in the least affected, should immediately discontinue, all employments in any manner connected with the metal; obviating at the same time costiveness, and other urgent symptoms. Among the various articles, which have been proposed, as antidotes for this poison, particular dependence has been placed upon oleagenous and mucilaginous substances; I am led however, from the result of several experiments, to conclude, that they are ineffectual, when large quantities of the metal have been received into the stomach; experience teaches us, nevertheless, that a greasy unctuous diet, in some degree protects persons who work in lead, from the noxious influence of its effluvia. Mercury in small doses, has been lately recommended as a preven-

tive against this poison ; and there is no doubt it would be serviceable ; but the inconveniences arising from its operation, are too considerable, ever to allow of its general adoption. Cleanliness, is an object of great importance, and it is known, that persons, employed in the different manufactories of lead ore, who keep themselves clean, are less liable to be affected by it, than those who are negligent of their persons, and who never take the precaution of washing their hands, previous to eating.

OF THE PRIMARY EFFECTS, OF THE SACCCHARUM SATURNI, ON THE HUMAN BODY.

There has been a great change of opinion, concerning the operation of medicines, within the last few years. The doctrine of their sedative operation, was for a long time universally admitted. But latter observation and experience have shewn its absurdity. The justly celebrated Dr. John Brown, was the first to assert, the stimulating qualities of opium ; and from this period, succeeding writers were induced to examine more attentively, the primary effects of other substances.

Those, who have written on the subject of lead, have noticed only its remarkable power

in lessening the frequency and force of the arterial system, and there are many, who still adhere to the opinion of its direct sedative action. In order to determine, whether its primary operation be that of a sedative or incitant, I made the following experiments.

EXPERIMENT I.

At 9 o'clock in the morning, half an hour after eating a moderate breakfast of light food, I took one grain of saccharum saturni, mixed with a little syrup. My pulse beating 69 strokes in a minute. In 5 minutes, it stood at 69; in 10 minutes, it was increased 2 strokes; in 15 minutes, it beat 73, but was not increased in fullness. In 20 minutes, I believed it to be quicker, and it beat 75; in 30 minutes, my pulse beat 72; at 40 minutes it beat 72; in 50 minutes, beat 68, and was somewhat smaller. In one hour, I felt a slight degree of uneasiness at the stomach, which soon went off. In 70 minutes, my pulse beat 66, and was reduced in volume; I attributed this sinking of the pulse, to the temperature of the room, which was lowered from suffering the fire to go out. In 80 minutes, my pulse was 68, and natural; but continued to vary from 67 to 70, for an hour after.

EXPERIMENT II.

At 10 o'clock, A. M. about one hour after breakfast, I took 2 grains of fugar of lead, mixed in a little fyryp. My pulfe beat 70 ftrokes in a minute, its natural ftandard; when the following changes were obferved.

In	3	6	9	12	15	18	20	23	26	29	M.
P. B.	70	70	72	72	74	73	74	73	70	68	St.

In	32	36	40	45	50	55	60	70	80	90	M.
P. B.	68	67	69	68	67	65	65	66	64	66	St.

In	100	110	120	130	140	150	160	M.
P. B.	67	67	69	67	68	68	70	St.

In 15 minutes, after taking the medicine; my pulfe was increafed in number, and rather quicker; but no increafe of ftrength was perceptible. In 50 minutes, my pulfe was flower, and a little diminifhed in volume, at the expiration of one hour, there was an evident diminution of ftrength in the pulfe—at 80 minutes, had a naufea, which lafted 15 minutes, with pulfe contracted; in 150 minutes my pulfe had refumed its natural action. I continued to examine it for feveral hours after, when it varied from 68 to 73.

EXPERIMENT III.

In one hour and 20 minutes, after making a light breakfast; I took 3 grains of

faccharum saturni, dissolved in a little fyrup;
my pulse beating 72 strokes in a minute.*

In	2	5	8	11	14	17	20	23	26	29	M.
P. B.	72	68	75	73	75	76	74	71	70	71	St.

In	32	35	38	41	45	50	60	65	70	80	M.
P. B.	68	68	70	70	72	69	64	64	60	61	St.

In	85	90	100	110	120	130	140	150	M.
P. B.	61	62	68	64	67	60	68	69	St.

In	165	180	190	210	225	240	M.
P. B.	65	68	70	70	67	71	St.

In 8 minutes, my pulse was perceptibly stronger, with a slight heat, about the precordia; at the end of 14 minutes, my pulse had increased in frequency and was quicker; when 20 minutes, had elapsed, my pulse was considerably reduced in volume; but remained preternaturally quick. In one hour, my pulse was still smaller than natural, and in frequency, reduced from 70 to 64, with an uneasy sensation in the head. In 85 minutes, my pulse was round and soft: at one hour, and 20 minutes, it had nearly resumed its original fullness.

At the expiration of two hours, and 40 minutes, had a pain in the head, with nausea, which lasted about 15 or 20 minutes, during

* Dr. Horfield did me the favour to be present during this experiment.

the remainder of the day, my pulse was natural.

EXPERIMENT IV.

At 40 minutes, past ten o'clock A. M. Mr. George Lee, took 4 grains of fugar of lead, formed into a pill, with a small quantity of conserve of roses. His pulse beating 60 strokes in the minute, and perfectly natural. In 5 minutes, his pulse beat 61—In ten minutes it beat 62—At 15 minutes, his pulse had increased three strokes in frequency, but was not fuller. In 20 minutes, his pulse stood at 63, and was quicker; in 25 minutes, it beat 64, but no unusual sensations were experienced. In 40 minutes, it was at 60, and a little contracted. From one to two hours his pulse had lessened in force, and was gradually sinking; I was now prevented from further examination; but had every reason to conclude that it would have been reduced several strokes more.

EXPERIMENT V.

At ten o'clock in the morning, being a little indisposed, with a slight head-ach, and some increase of tention and fullness in my pulse; I took 4 grains of sac. fat. combined

with a small quantity of conserve of roses. My pulse beating 74 strokes in the minute.

In	3	6	9	12	15	18	21	24	28	32	M.
P. B.	74	73	75	76	78	80	80	83	81	82	St.

In	36	40	50	60	70	90	100	110	120	M.
P. B.	81	80	78	80	76	78	76	75	72	St.

In	130	140	150	160	170	180	190	200	M.
P. B.	68	70	67	69	72	75	70	72	St.

In 8 minutes, I experienced a sensation of heat at my stomach. Before 20 minutes had elapsed my pulse was increased in number and fulness, with an increase of heat at stomach; when 40 minutes had expired, my stomach was more affected, but had no disposition to vomit; with a preternatural warmth of the cutaneous system. In 50 minutes, had an operation on the bowels; in an hour my skin became moist, which continued for 15 minutes; my pulse at the end of two hours was quicker, though not more frequent than natural; about this time I had a small bilious evacuation from the bowels. In three hours, my stomach recovered its tone, and my head was relieved of pain.

During the remainder of the day, I felt in no other respect disordered, than a slight difficulty of breathing; my pulse being rather more feeble than usual.

EXPERIMENT VI.

On the tenth day after experiment the 5th was made, at seven o'clock A. M. I took on an empty stomach, five grains of sugar of lead; my pulse beating 66 in a minute.

In	3	6	9	12	15	18	20	23	26	30	M.
P. B.	66	68	71	71	73	76	75	75	74	76	St.

In	35	40	45	50	55	60	70	80	90	M.
P. B.	75	73	70	73	72	70	67	68	67	St.

In	100	110	120	130	140	150	160	M.
P. B.	65	63	60	58	60	58	57	St.

In 6 minutes, I felt a warmth at the stomach; in 12 minutes, my pulse was somewhat increased in force, with an increase of heat at stomach; in 20 minutes the fullness of the arterial system was rather greater. At the end of 40 minutes, my cheeks seemed warmer than usual; when one hour had elapsed, I felt some uneasiness at stomach, my pulse being weak and corded; when two hours had elapsed, considerable nausea occurred; my pulse feeble and not so frequent; at 130 minutes, made several effects to vomit, but discharged nothing from my stomach; at 140 minutes the nausea returned.

At 160 minutes feeling extremely unpleasant, with my pulse feeble and tremulous, and not having eat any thing during the morning,

I took some toast and coffee, which raised my pulse and much composed my stomach.

I laid down and after a while a moisture came on, that lasted about half an hour ; at one o'clock I arose, being much recovered, and took a little soup. I had throughout the after part of the day, a small degree of tightness, across the thorax ; my pulse being irregular and feeble ; my urine was highly coloured, but my head and bowels remained unaffected.

The two following experiments were communicated to me, by Dr. Robert Black, and Mr. Washington, of Alexandria. Having made, says Dr. Black, a very light and early breakfast, at ten o'clock, my pulse beating 88 in a minute, I took two grains of sugar of lead. In ten minutes my pulse rose to 96, somewhat contracted and a little tense ; my hands and wrists were rather cool, accompanied with a considerable degree of moisture. In 20 minutes my pulse fell to 90 ; became rather feeble, and the moisture on my skin increased ; in 25 minutes my pulse stood at 88. I felt a slight sensation of heat and uneasiness about the region of the stomach ; it was not accompanied with the slightest nausea, but it appeared to be confined principally to the external parts. In 50 minutes my pulse rose

to 94 and became irregular. This change I attributed to my approaching near the fire and placing my feet on the projecting plate of a Franklin stove which was heated. In 75 minutes my pulse beat 90, which is nearly its natural standard, it was soft and regular, continuing in the same state throughout the day.

EXPERIMENT VIII.

At ten o'clock, says Mr. Washington, after making a slight breakfast of bread and coffee, I took one grain of sac. fat. mixed in sugar and water; my pulse beating 80 strokes in the minute, was somewhat fuller and more irregular, than natural. In 5 minutes it rose to 84, but not so full or varying. In 10 minutes it was 98 but appeared small, tense and irregular. In 15 minutes it fell to 86 was soft and even; in 20 minutes, there was some degree of warmth about my stomach, accompanied with a slight nausea, and disposition to vomit, though an emesis did not take place. In 25 minutes my pulse was at 84, uneven and full, at this time my skin became moist and clammy, imparting to the touch a sensation, not dissimilar to that which is usually experienced, about the close of a paroxysm of

fever. In 60 minutes it was regular and soft, and at 76 minutes I felt a disagreeable taste in my mouth, very like that produced by copper, and resembling that which accompanies an incipient ptyalism; and in a short time after an increased secretion of saliva took place, which continued during the day. At the expiration of 100 minutes, my pulse resumed its natural standard.

EXPERIMENT IX.

To a dog, whose pulsation, as well as I could determine, was about 114 in a minute, I gave one drachm of sugar of lead; In 10 minutes he appeared a little uneasy; in 15 minutes his pulse became more frequent and stronger, with a disposition to vomit. At 20 minutes there was a great irregularity in his movements; with laborious respiration, the diaphragm seeming to be much convulsed. In a few minutes after this, he discharged from his stomach some frothy matter, and I judged, nearly all the medicine. At 32 minutes he had an evacuation from the bowels, consisting of fæces and mucus. When 50 minutes had elapsed, his pulse was nearly imperceptible, imparting to the touch a tre-

mulous sensation. In an hour he became dull, being much relieved, and fell asleep. In 4 hours from this time, I injected into his right jugular vein, a saturnine solution. In about 30 minutes, he expired; having been previously affected with convulsions, delirium, and other distressing symptoms. On examining his body, the appearances, were as follow. The whole stomach was contracted, particularly its superior orifice; its blood-vessels distended, with inflammation in several parts, especially at the termination of the œsophagus. The duodenum was turgid and inflamed, containing a small quantity of a dark fluid; the other intestines had a natural appearance: the bladder kidneys and liver were not affected.

The gall-bladder was filled with a quantity of bile, of a darker colour than usual. There were some marks of congestion in the lungs. On opening the cranium, the external part of the brain appeared natural, but within its substance, was found a small quantity of extravasated blood.

In two similar experiments, except, that, the solution was not injected into the blood-vessel; the result was nearly the same: in the one, however, a preternatural secretion

of saliva occurred ; and in the other, it was remarkable, that the rectum was the only part of the intestines, which shewed marks of inflammation.

Since the first introduction of lead into the materia medica, it has been uniformly classed with medicines, called sedatives, till Professor Barton suggested the probability of its primary operation, being that of a stimulant; this opinion, is corroborated by the preceding experiments ; and the analogy of its effects, with those of other incitants, affords additional proof of the truth of the doctrine : Let us then briefly point out this similarity of the effects of lead, to those of other stimulants.

Do many stimulants, as alcohol, opium, digitalis, stramonium, &c. increase the frequency and force, of the arterial system ? So does the sugar of lead. In experiments the 4th, 5th, 6th and 7th, the pulse rose from 8 to 12 strokes in the minute, with considerable encrease of force, tension, and quickness.

Have incitants the effect of ultimately reducing the force and frequency of the arterial system ? so has the sac .fat. to a great degree.

Do opium, mercury, and seneka root, occasion an increased secretion of saliva ? so likewise do the preparations of lead. This

symptom occurred in two of my experiments. Dr. R. Warren, says, out of thirty-two cases of colica pictonum, caused by lead, which he had an opportunity of observing, four were salivated, and others complained that their mouths and throats were sore.* The same symptoms occurred to a very extensive degree, in Mr. Thunberg and others, as already mentioned.

Are not heat at stomach, nausea, and vomiting, consequent upon taking stimulants? such are the effects of lead. Do not arsenic, opium, and other poisons, produce convulsion and paralysis? The preparations of lead have done the same.

Various stimulating substances are known to constipate the bowels; lead has the same effect.

Is the cutaneous system influenced by stimuli? so likewise it is by the sugar of lead, causing preternatural heat; this was the effect of lead on myself and several of the subjects of my other experiments.

Do certain incitants induce diaphoresis? In the experiments communicated by Mr. Washington and Dr. Black, and in one that I made upon myself, the same effect was pro-

* Vid. Med. Trans. Vol. I.

duced. Are the different secretions and excretions affected by stimuli? so likewise they are by the preparations of lead.

Have dissections, discovered inflammation, and other morbid phenomena, to be the effects of stimuli? Such also, are the consequences of the sugar of lead; in the examination of two dogs, that had taken a drachm of this salt, nearly the whole alimentary canal evinced marks of inflammation and excessive action.

The interesting and minute relations of its deleterious effects by Mr. Thunberg, as mentioned above, confirms the opinion beyond a doubt; fever, inflammation, and a numerous train of other malignant symptoms, were in this instance its consequences; and no one will contend that these phenomena could have been produced but by powerful stimulants.

We may then, fairly conclude the primary operation of the preparations of lead, is that of a stimulant, but that these effects are extremely transitory, and are quickly followed by those of a contrary nature. Although we are able by experiment, to decide whether the first effects of a substance be sedative or stimulating; still the subject of the *modus operandi* of medicines is cloathed in much mystery. To ascertain precisely, upon what prin-

ciple, or in what manner, the action of substances upon the human body, is brought about, will be a point as likely to elude the investigation of man, as any connected with the science of medicine.—A pill of opium may be taken and exert every active property it possesses, without a diminution of bulk.* From the rapid improvements, which the science of chemistry has lately undergone some, have been induced to suppose this beautiful and pleasing study would lead to an explanation of those mysterious laws and operations of nature. The chemist by analysis, may discover if a substance be composed of a gum, resin, &c. he may, more over, determine accurately the proportion of each elementary part that is necessary to the formation of a substance; but can he, by these means, explain the principles and functions of animal or vegetable life; or is this science, sufficient to teach us, why two gums, the external characters of which are the same, should in their operation produce such different effects; or will it inform us wherefore, some substances create salivation, some vomiting, and others sleep?

* Karr Boerhaave.

Whether it depends upon a peculiar modification of particles, or whether it depends upon a particular proportion of the incitant, astringent, and sedative principles ; or upon what circumstances, it does depend ; must remain a secret, until physiologists shall *obtain a more perfect knowledge of the laws and æconomy of organic matter.*

OF THE INTERNAL USE, OF SUGAR OF LEAD IN DISEASES.

Before we enter, upon the consideration of the use of lead in diseases, it will be necessary to enquire, to what extent, the preparations of this metal have been taken, either intentionally or by accident, without injury.

A girl took eighteen grains of sugar of lead every day, for three weeks, without any injurious consequences. A weak man, forty years old, took at four doses, in the course of forty-eight hours, in a liniment, one drachm of saccharum saturni, without any other disagreeable effect, than a giddiness, and heat at stomach. At Salford, in Warwickshire, a person, swallowed near a bottle of Goulard's extract ; and no inconvenience ensued.*

* Johnson's Medical Essays.

A woman took by accident, a scruple of acetate of lead; without inconvenience from it.*

I knew a child, six years old, to drink a portion of saturnine solution, which contained about four grains of sacch. sat. and no ill effect followed.

A man for the cure of the gout, was advised by an empiric, to use an oxid of lead, which he did, in such quantities, as to take two pounds, in fifteen days; he remained free from disease, till twenty days after he began its use; when he was attacked with dysentery. His recovery was preceded by a very obstinate jaundice.†

I have been informed by a gentleman of Devonshire, says, Sir George Baker, that it had long been a custom with him, to restrain the acetous fermentation of his cider, by throwing into it a quantity of sugar of lead; and, that he was convinced, no ill effects ever followed the practice.‡

Many English Dispensatories, and old systems of medicine, recommend, from seven to twelve grains of saccharum saturni at a dose. And in their former naval and military Dis-

* Johnson's Medical Essays, P. 117. 123, 124.

† Professor Barton's M. S. Notes. ‡ Lon. Med. Transf.

penfatories, a fcruple is ordered for a fingle dofe.

Anterior to the time of Paracelfus, we have nothing certain, refpe&ting the internal ufe of the preparations of lead. From the early part of the fixteenth century, till the middle of the feventeenth, Tachenius, Crollius, and others were accuftomed to employ them, as valuable medicines. In 1741, Hundertmark, publifhed a differtation at Lipfic, wherein he affures us, that he gave the fugar of lead, to the quantity of four grains, with wonderful fuccefs, in fome desperate cafes of phrenetic delirium, and in fome cafes of peripnumony,* and feveral differtations alfo, appeared in Europe, on the fame fubject, towards the end of the eighteenth century.

However much, modern phyficians have wifhed to lay afide, the internal ufe of thefe preparations, it is not the lefs certain, that the ancients afcribed confiderable virtues to them, as powerful and ufeul remedies, in many difeafes.

The Chinefe, very frequently adminifter internally various preparations of lead, to which, they afcribe extraordinary virtues.

* Vid. Gmelin

Such efficacy was this mineral supposed to possess in phthisis pulmonalis, that one of its preparations, acquired the appellation of *tinctura antiphthisica*. Etmuller who directed his attention particularly to the use, of saturnine preparations in consumption, to prevent the cough and sweating that occur in hectic, recommends, a formula containing ten grains of the sugar of lead, to be taken every night at two doses

Mr. White in a letter to Dr. Duncan,* observes, that, he found the action of the heart, and the frequency of the pulse, evidently diminished, by the use of the *tinctura saturni* and that in phthisis pulmonalis, it constantly abated the hectic fever, and sweats. Sir George Baker acknowledges, that, there are scarcely any medicines, which produce, their effects more immediately, or more certainly, than the preparations of lead, in colloquative sweats, in fluxes, or in hemorrhagies.†

The digitalis has been particularly serviceable, in certain stages of consumption, and from the similarity of its operation, to that, of sugar of lead, I am lead to conclude, the latter, will prove a valuable remedy, in that

* Med. Com. Vol. III. † Med. Trans. Vol. I.

stage of the disease, in which, great morbid action of the arterial system prevails.

In Diabetes,* the acetate of lead, has been used with great advantage. Dr. Rush has lately endeavoured to explain, the phenomena of this disease, by considering it a state of fever, and the success which attended the practice, to which this opinion leads, corroborates the idea of its being a febrile affection. The remedies which he recommends, are, repeated blood-lettings; in small quantities, salivation, low regimen, &c. Considering, the power of saccharum saturni, in restraining all morbid secretions, and evacuations, and its known influence over the pulse, it appears to me, that much good would be derived from its application in this disease.

Much likewise, has been said, concerning the use of this medicine in dysentery and diarrhœa; and indeed, from their inflammatory nature, and from their being seated in that system, on which, lead exerts its most immediate, and permanent operation, it appears, to be particularly adapted to their cure, and accordingly, we find that it has been used with advantage by respectable writers. When there is inflammation of the intestines, Re-

* Vid. Etmuller's Practice.

virius observes, it will be necessary to let blood, and give glysters of the sugar of lead, dissolved in rose water ; and at the same time, says, ten grains of this salt, mixed with conserve of roses, should to be taken by the mouth ; every morning. By Etmuller the acetate of lead, is considered a specific in dysentery ; and when astringents, and absorbents are indicated, Dr. Shaw, confidently informs us, it is a most valuable and useful medicine.

At the royal and universal dispensary, there is a formula, containing half a grain of this salt, which is often employed by the physicians of that institution, in cases of hemorrhagies, and obstinate diarrhœas, with advantage ; and no instance has occurred, in which any injury arose from its use.†

The New-York Repository contains an interesting account of the efficacy of the acetate of lead, in relieving several cases of chronic diarrhœa, communicated in a letter from Dr. John Archer, jun. of Maryland, to Dr. John Claiborne of Virginia. The first case which Dr. Archer relates was of a Mr. S. R. aged 22 years, a man of strong constitution, who,

† Vid. Clutterbuck's Paper, &c.

in June, 1798, after severe exercise, was attacked with dysentery, which at the expiration of four weeks terminated in a painful diarrhœa, which continued unrestrained until the latter end of November. His body was much emaciated, and during this time he had violent pains in his bowels, with frequent discharges of blood. After the failure of the usual remedies, saturnine injections were administered, but these also proving ineffectual, recourse was had to the exhibition of this preparation of lead, by the mouth, to the quantity of three grains, three times a day, made into a pill, with syrup; with instructions to the patient, to discontinue the medicine, as soon as the purging moderated. In two days the diarrhœa was much abated; he continued however, to take the medicine; the consequence was, costiveness, and extreme pain of the bowels; which was speedily removed, by a dose of glauber's salts.

His disease again returned, but by the use of the saturnine pills, reduced to two grains of the salt, his diarrhœa was kept under, and in the course of two weeks, the disease was perfectly cured. The other cases related by this gentleman are equally interesting: in none of them were there any permanent disagreeable

consequences from the use of the medicine : the slight inconvenience which occurred was obviated by a single dose of salts. I regret that the pulse was not more attended to in the relation of these cases.

IN EPILEPSY.

There is no disease, the pathology of which is involved in more obscurity than this, and till theory and experience shall elucidate its nature, every medicine that can be prescribed for its cure, must be in a great measure bordering on empiricism.

Dr. Rush, to whom we are much indebted for the explanation of the phenomena of some diseases, is of opinion, that to epilepsy, no determinate seat can be assigned. He supposes it to be exclusively confined, neither to the arterial, nor nervous, nor any other system, but to extend its morbid influence over the whole animal economy. He admits it to be a nervous or febrile disease, and not unfrequently partaking of the nature of both in the same person, but if we judge of the truth of theory, from the success of its application, in practice, we must acknowledge that this, like every other, serves only to inform us of our ignorance, and to convince us, that we have

yet to acquire much important information, from the mysterious laws and operations of nature, before the science of medicine shall become perfect, and man shall cease to die, but from old age.

That epilepsy is often a febrile disease, may be infered from its being induced by the same causes, which produce other fevers, and from its being accompanied with many of the usual symptoms of fever; the pulse is often full and tense, pupils of the eyes dilated, face flushed, &c. It moreover attacks, persons at that time of life, when the system is plethoric, and pre-disposed to febrile diseases; it sometimes also, occurs with considerable violence, without any appearance of fever. Opium, camphor, mercury, and lately the nitrate of silver, have all been useful, but the sugar of lead will probably prove to be equal, if not superior, to any of them, in this disease; it has frequently been known to suspend the fits, and has sometimes cured the disease, but admitting, that it only protracts the intervals between the fits, this effect alone would be sufficient, to recommend it to the attention of physicians. A person, not well versed in the treatment of epilepsy, will find it difficult to point out the particular

stages and circumstances of this disease, under which the acetite of lead will be most likely to succeed, but from the known power of this medicine in lowering the pulse, I should suppose it particularly adapted to the cure of those cases of the disease which are accompanied with an inflammatory diathesis, and which have regular periods of occurrence; but as this medicine, to be effectual, requires to be taken for some time before the fit, it might be objected to, in cases where the fits occurred at distant and irregular intervals, or where the paroxysm was not ushered in, by some characteristic symptom; as injurious effects sometimes result from its long continued use.

Near two hundred years ago it was used with success in the epilepsy of children by Agricola; and a boy was lately effectually cured of this formidable disease by taking two grains of the acetate of lead three times a day; and in two instances likewise in the Pennsylvania Hospital it suspended the fits for several weeks.*

In fluor albus and gleet, the acetate of lead has been administered internally, with suc-

*Dr. Rush. M. S. Notes.

cess. In the year 1799, I had an opportunity of witnessing its efficacy, in a case of leucorrhœa, in a poor woman aged about 27 years ; she had been subject to the complaint for near twenty months ; her pulse beat 85 or 86, and was preternaturally quick and tense ; she was blooded, salivated, and had observed an antiphlogistic regimen, without any benefit. In this situation, she was directed to take half a grain of sugar of lead, combined with two grains of gum kino, three times a day ; on the third day after the use of the medicine, the pulse, was diminished in frequency three or four strokes, but the discharge, and other symptoms remained as before. The quantity of the salt was now increased, to one grain, to be taken at the same intervals as before, on the second day after the use of the increased dose, her pulse continued to decrease in frequency, and the discharge was somewhat abated ; she was now costive, and being apprehensive that disagreeable symptoms might ensue, from the too long retention of the medicine in the system, it was intermitted and a dose of castor oil exhibited. In a few days after, the medicine was again had recourse to, which effectually relieved the pa-

tient, without causing the most trifling unpleasant symptom.

IN HEMORRHAGES.

In the cure of no disease will the sugar of lead be found more advantageous, than in hemorrhagy; and with Dr. Heberden I believe there is scarcely any medicine, that could with more propriety be called an internal specific, than saccharum saturni, in hemorrhages of the primæ viæ .

Dr. Reynolds of London, has experienced in a particular manner, the efficacy of the preparations of this mineral, in restraining hæmoptœ, epistaxis, and memorrhagia. To a young man labouring under hæmoptysis was given the following formula.

R. sac. Sat. gr. 1.

Con. ros. rub. grs. ii.

Laud. gtt. v. m.

In a day or two, the dose was increased to a grain and a half. He had been bled several times, had taken saline medicines, and observed the lowest diet without advantage. His pulse beat 108 strokes in the minute, full and hard; on the 4th day after taking the medicine, the spitting ceased en-

tirely, his pulse reduced to 90, soft and even; he had regularly two motions a day.*

If the spitting of blood is violent, Shaw, advises, half a scruple of saccharum saturni, to be taken every fifth hour, the patient at the same time to drink freely of diluted tincture of red roses.

In June 1800, a poor white man, aged 30, of slender make and healthy habit, was attacked with a hymoptœsis, which was occasioned by the too great exercise of the lungs, from blowing the fife, his pulse, beating 89 in a minute, quick and tense, breathing laborious, and indicating considerable congestion. He was directed to take the following formula, every fourth hour :

R. Sac. sat. ii. grs.

Theriac. And. iii. grs. m.

In 15 hours after he commenced taking this medicine, the spitting had entirely ceased; his pulse much reduced in force, and lessened in frequency. The congestion being not effectually relieved, he took fifteen grains of calomel; which operated moderately on the bowels, at the same time slightly affecting the mouth. Nothing else after this was necessary.

* Med. Com. Vol. III.

“ A woman between 40 and 50 years old, labouring under uterine hæmorrhages, was relieved by the saturnine tincture.”

“ Another woman had a flooding terminated, which had lasted two months, unchecked by all the most powerful astringents in common use, by taking four grains of sac. sat.*

Equal quantity of white vitriol and sugar of lead, in the proportion of half a grain, has also been given with the happiest effects, in menorrhagia.

In epistaxis, the success attending the internal use of this salt, has been alike evident ; but I suppose it might be employed externally in this variety of bleeding; with every advantage. A physician in this city, was in the habit of using it as a snuff, in bleeding from the nose ; which had every desired effect.

In tetanic affections, might not the saccharum saturni, be employed with great advantage? The use of this remedy in tetanus, is sanctioned by the authority of Mr. John Hunter, and at all events deserves a trial.

* Med. Trans. Vol. II.

The following interesting relation of facts and observations was communicated to me in a letter by Dr. Barton.

“ DEAR SIR,

“ I exceedingly regret, that my late severe illness has prevented me from furnishing you with the particulars of my practice with the acetite, or sugar of lead, in the treatment of different diseases. At present, I can give you but little on the subject, that is worthy of your attention.

“ In the course of the last five years, I have employed this preparation of lead in cases of hæmorrhages ; in hæmoptysis, hæmorrhages from the stomach and intestines, and in uterine hæmorrhages, both of pregnant and of non-pregnant women. Of late, I have also employed it, very largely, in a case of obstinate gonorrhœa. But my practice having been principally confined to the treatment of hæmorrhages, I shall content myself with making a few observations on the use of the medicine in these diseases.

In a case of hæmoptysis, which threatened the speedy death of the patient, I gave the sugar of lead, in doses of six grains every two hours, for several hours together. I ascribe the *complete* recovery of my patient solely to this

treatment. This was one of the first cases in which I exhibited the medicine, and I should not have ventured upon such doses (for I had been taught to believe, that the preparations of lead ought always to be exhibited with the greatest circumspection), had I not thought the patient irrecoverable by any other means. I had no cause, however, to regret the employment of the lead; for it produced not the least inconvenience.

But it is chiefly in uterine hæmorrhages that I have administered the sugar of lead. I have now exhibited it in many cases; I think not less than eighteen or twenty. I have ever given it with some advantage; generally to the complete cure of the patient, and, I have never known it to produce any serious inconvenience. It has sometimes seemed to occasion a slight sickness at stomach, but this, which could not always be ascribed to the lead, was nowise injurious to the patient. In one case, it seemed to occasion a slight degree of tenesmus. But this was soon removed by a dose of castor-oil. I am certain, that it sometimes operates, even in small doses, as a laxative.

In the administration of the sugar of lead, I have almost always combined it with a portion of opium. I still continue this practice, because I have been induced to believe, that the lead may be given in much larger doses *with* than *without* the opium. Perhaps I may be mistaken.

With respect to the dose of the sugar of lead, this, I need not tell you, must vary according to the age, the strength, and the case of the patient. Hitherto, my practice with this medicine, has been almost solely confined to adults. In uterine hæmorrhages, I have seldom given less than two grains at a dose (in combination with a grain of opium), twice a day. But I have often given larger doses. Even small doses, however, sometimes produce an early, I was going to say an *immediate* effect. This, I have particularly remarked, in the case of a lady, who had laboured under a menorrhagia for fourteen days, before I saw her. I found her with a quick and irritated pulse, flushings, severe pain in the region of the loins, and with much affection of the head: I had no hesitation in advising her to lose some blood from her arm; to this she objected. She was immediately put upon the use

of the sugar of lead; in less than one hour, the hæmorrhage was considerably diminished; she took a second dose, about four hours after the first, and was so completely recovered that there was no necessity to continue the medicine.

I shall not trouble you with any speculations concerning the *modus operandi* of this medicine in curing hæmorrhages. I have touched upon this subject in my lectures, which you have done me the honour to attend; and, I doubt not, that you have, in the course of your experimental inquiry, been able, in some measure, to satisfy yourself as to the manner in which the lead is of use in these cases. I will only observe, that I am persuaded, that the medicine does not produce *all* its good effects, merely by its quality of lowering the pulse. It appears to be useful both in the active, and in the passive hæmorrhages. I am not ashamed to mention these old names.

I have had some experience with the use of the digitalis in the treatment of uterine hæmorrhages. This is, certainly, a valuable medicine. I can readily believe Dr. Ferriar, that it has often done much good. In my hand, however, it has appeared to be much

less efficacious than the sugar of lead. Of one thing I am persuaded, that the digitalis does not, in general, produce so immediate an effect upon the disease as the lead does.

I am sure that you, who know with what caution I always speak of medicines in my lectures, will not suppose, that I recommend the sugar of lead as a *specific* for the cure of uterine or other hæmorrhages. I confidently recommend it, however, as a *powerful* and *valuable* medicine ; and I cannot but suppose that it may generally, if not always, be exhibited *with perfect safety*. Yet it may be necessary, in cases in which we have not already given the medicine, to watch its effects with a nice attention. I believe, that there are some persons who are liable to be injured by very small portions of lead. I believe it is a fact, that lead, whether it be taken into the stomach, or applied in the shape of vapour, externally to the body, does not, in general, produce its bad effects until some days after it has been applied.

These facts should lead us to observe some degree of circumspection in the use of the medicine, in the treatment of diseases. It is not impossible that one or two grains of the sugar of lead, may now and then, occasion some in-

convenience. But in the exhibition of this medicine, I have been more governed by the other circumstances which I have mentioned: I have been fearful, lest the patient might suffer from an accumulation of the lead in the system. When, therefore, in the treatment of hæmorrhages, I have not found evident benefit from the medicine in two or three days, I have laid it aside for a short time (three or four days); and, when necessary, have resumed the use of it again.

I fear that this very imperfect, but faithful statement of my practice, can be of little use to you. Such as it is, I beg you to receive it with my best wishes for your prosperity and usefulness in life.

I am,

My dear Sir,

Your affectionate friend,

And humble servant,

BENJAMIN SMITH BARTON.

Philadelphia, June 4th, 1801.

TO MR. SEMMES.

FINIS.

